

International Energy Biweekly Review

26 July 1978

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INTERNATIONAL ENERGY BIWEEKLY REVIEW

26 April 1978

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| An OPEC committee's recommendation to peg cartel oil prices to a basket of currencies would still need approval of OPEC governments; speculation continues within OPEC on the size and timing of future oil price increases—we discount recent OPEC talk of an increase before yearend; Iraq has implied its oil potential might not be as large as has been widely assumed. | |
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| Vienna has opted for a referendum in November to determine the fate of Austria's completed but still idle \$450 million nuclear power plant; the issue is finding an acceptable disposal site for spent nuclear fuel. | |

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INTERNATIONAL ENERGY BIWEEKLY REVIEW

Overview

An OPEC committee of financial experts recommended last week that OPEC oil prices be pegged to a basket of currencies in order to mitigate further losses in purchasing power caused by the decline of the US dollar. The recommendation would have to be acted on by OPEC governments at the next scheduled ministerial conference this December in Abu Dhabi, or at an extraordinary meeting that could be called by the current president of OPEC, Kuwaiti Oil Minister Ali Khalifa al-Sabah.

Adoption of a basket of currencies has been under consideration in OPEC financial circles for several years. In June 1975, OPEC oil ministers agreed in principle to peg oil prices to the Special Drawing Rights used by the International Monetary Fund, but the plan was never implemented. Since that time, financial officials of the OPEC countries have examined several other currency baskets.

If the most recent proposal is accepted by the cartel, the US dollar would remain an important instrument in world petroleum trade; oil would still be priced and paid for in dollars. The dollar cost of oil would rise when the dollar weakened and fall if the dollar strengthened. The immediate impact of an OPEC decision to act on this matter would be conditioned by the timing, base period, and currency basket chosen for the adjustment.

A continued decline of the dollar through December would buttress arguments within OPEC for carrying out this recommendation. However, should the dollar stabilize or strengthen, some OPEC members, most notably Saudi Arabia, might back away from this pricing shift. Undersecretary of State Cooper was informed by the Governor of the Saudi Arabian Monetary Agency (SAMA), Quraishi, at the time of the decision, that his government opposes the currency basket approach to oil pricing, but that all other OPEC members favor the change.

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Speculation continues within OPEC concerning the size and timing of future oil price increases, not only to compensate for inflation and the declining dollar, but in expectation of possible future oil supply shortfalls. One recently suggested price strategy that is likely to gain favor among oil exporting countries is periodic small

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price increases, such as 2.0 to 2.5 percent on a quarterly basis. While major oil importing countries might oppose this overall approach, they would find it difficult to mount an effective diplomatic campaign against any one such increase.

Stories circulating out of Kuwait imply the existence of considerable sentiment within OPEC for a price increase as early as fourth quarter 1978. We tend to doubt that OPEC will take any action on a general oil price increase before yearend.

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Iraqi Oil Minister, Tayih Abd al-Karim, gave the first public indication last week that Iraqi petroleum production targets might be pared to avert an early depletion of his country's oil reserves and to help overcome the current supply surplus on the world oil market. Most observers, until recently, have viewed Iraq as favoring a rapid expansion of its oil productive capacity to capture an increasing share of the market. Buttressed by assessments of an enormous potential oil reserve base—by some estimates as high as 100 billion barrels—earlier Iraqi plans established productive capacity targets ranging from 5.0 to 6.0 million b/d by the mid-1980s, compared to only about 3.0 million b/d at present.

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ITALY: THE ELECTRIC POWER PROGRAM AND ENERGY POLICY

The 1973/74 oil crisis led many countries, including Italy, to accelerate or formulate ambitious nuclear power programs. In 1975, Rome announced plans to install 20,000 megawatts electrical (MWe) of nuclear power by 1985. Since then inflation, sitting problems, and antinuclear sentiment have raised the economic and political costs of nuclear power programs in Italy and elsewhere. The unforeseen slackening in the growth of electricity demand has also undermined the rationale for large additions of new generating capacity, whether nuclear or thermal. Nevertheless, Rome plans to pursue a scaled down version of its program and will seek US assistance in financing it. This article examines Italy's electric power plans and needs in light of recent changes.

Background

In 1960, Italy's power system was highly fragmented, consisting of more than 1,000 utilities and private industrial firms producing electricity. Dissatisfied with the inefficiencies inherent in the industry's structure and anxious to win the support of leftwing parties, the then ruling Christian Democratic government pushed legislation through Parliament in 1962 that nationalized all public suppliers except a few utilities owned by local governments. The legislation brought approximately 1,200 electric power companies under the centralized control of a newly created state entity—ENEL (National Electricity Agency).

The Existing Generating System

Italy's net generating capacity at the end of 1976 totaled about 41,000 MW. The bulk of generating capacity is in conventional thermal power plants, largely oil-fired facilities. With a peak demand of some 27,000 MW, one-third was in reserve compared with the 20 to 25 percent reserve ratio usually considered adequate in major developed countries.

Italy: Net Capacity of Electricity Generating Plants, 1976

| Type of Plant | Net Capacity (MW) | Percent of Total |
|----------------------------|----------------------|------------------|
| Total | 40,951 | 100.0 |
| Conventional thermal | 24,851 | 60.7 |
| Hydro | 15,180 | 37.1 |
| Nuclear | 522 | 1.3 |
| Geothermal | 398 | 1.0 |

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ENEL currently controls about 75 percent of domestic generating capacity; other public suppliers account for about 5 percent. The remaining capacity is held by industries that produce electricity for their own use. Because of its dominating position in the industry and its status as a government-owned firm, ENEL essentially determines the pace and direction of Italy's electric power development program. As such, ENEL is a key operating element in Rome's ambitious National Energy Plan (NEP).

The National Energy Plan

The NEP, first made public in 1975, represented the government's response to the 1973/74 oil embargo. At the time, Italy produced only 14 percent of its primary energy supply domestically; imported oil alone provided 76 percent of total energy consumed. The Ministry of Industry was tasked with drafting a national energy plan to reduce dependence on imported oil and to diversify sources of energy supply. Although the original NEP anticipated increased energy conservation and greater use of coal and natural gas, it emphasized substituting nuclear power for part of the growing volume of oil imports. To this end, it called for construction of twenty 1,000-MWe nuclear power plants by the mid-1980s at an estimated cost of \$22 billion (in 1977 prices).

Italy: Primary Energy Balance, 1976

Thousand b/d Oil Equivalent

| | | | |
|--|-------|----------------------------------|-----|
| Total energy consumption | 2,751 | | |
| Domestic production | 501 | | |
| Net imports | 2,250 | | |
| Coal | 199 | Natural Gas | 446 |
| Domestic production | 27 | Domestic production | 254 |
| Net imports | 172 | Net imports | 192 |
| Crude oil and petroleum products | 1,906 | Nuclear power | 16 |
| Domestic production | 22 | Hydro and geothermal power | 182 |
| Net imports | 1,884 | Net electricity imports | 2 |

The nuclear component of the program generated opposition from several quarters. The Socialist and Communist Parties and several major labor unions objected to the large role that US nuclear suppliers would play in providing equipment and technology. The electricity demand projections that guided the nuclear construction program were criticized as unrealistic. Environmental groups also came out strongly against the nuclear program.

After more than two years of debate and several revisions, Parliament approved a modified NEP in October 1977. The major emphasis of the program remains the

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same—developing nuclear energy to reduce dependence on imported oil—but the program's nuclear component has been cut back sharply. It now envisions building a total of 14 nuclear power plants eventually. Four 1,000-MWe light water reactors (LWRs) have already been ordered; four more may be ordered within the next year or so along with two 600-MWe heavy water Candu reactors, one each for Sicily and Sardinia. Parliamentary approval will be required for the construction of the final four LWRs. So far the cabinet-level Interministerial Planning Committee (CIPE) has recommended that only six LWRs and the two Candus be completed by 1985. This first stage of the program will cost an estimated \$7 to \$8 billion.

Despite the trimming of the NEP's original ambitious goals, serious reservations persist about the nuclear program. These focus on (a) ENEL's ability to fund and implement the nuclear program, and (b) assumptions in the NEP about economic growth in the early 1980s and projected growth of electricity consumption.

ENEL's Financial Status

By any of several measures, ENEL has been plagued by problems since it was established. Financing has been one of the major difficulties. The legislation that established ENEL did not provide an initial capital fund for investment. The nationalized firms came to ENEL not only with working capital but with all their debts. The latter totaled about \$4 billion at the time. In addition, ENEL had to compensate the former owners.

From the outset, ENEL has been trapped between rising costs and residential rate schedules frozen by the government. Parliament has found utility rate increases hard to swallow politically. For many years, labor unions and political parties on the left have successfully championed subsidized electricity rates for residential users. In 1974, Rome for the first time granted ENEL permission to revise its rate schedule. Another small rate increase was permitted in 1976 but it was only sufficient to sustain working capital requirements. Thus ENEL continues to lose money on most residential sales. For example, about 94 percent of all residential consumers paid an average of 3.4 cents per kilowatt hour (kWh) in 1977 while it cost ENEL 6.1 cents per kWh to supply electricity to a home.

Subsidized rates have meant steadily mounting operating losses for ENEL. Accumulated losses totaled \$3.1 billion at the end of 1976. Losses last year reached \$850 million, of which \$570 million was due to subsidizing residential consumers.

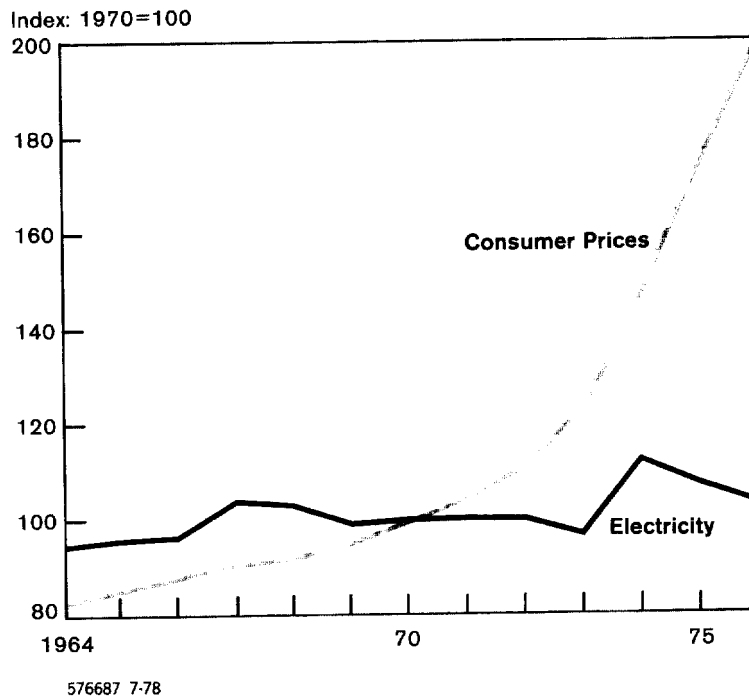
Rome now acknowledges that ENEL's financial problems must be addressed before negotiations for borrowing to finance the expansion program are begun. A planned two-stage increase (1 June and 1 July) should have raised rates by 16 percent;

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Italy: Electricity and Consumer Prices

another increase of 14 percent is being considered before yearend. The June-July increases will not, however, become effective for subsidized residential consumers until late in 1978. Moreover, scheduled increases of 6 percent annually in 1979-81 are well below the current rate of inflation. Nonetheless, Rome hopes the rate hikes will balance ENEL's budget by 1981. Rome also intends to help ENEL pay the interest on its debt and to provide \$3.5 billion for ENEL's investment program in 1979-82.

Government officials have talked optimistically about obtaining financing for part of the expansion program in the United States. The head of ENEL has indicated that an application would be made to the US Export-Import Bank at midyear, after ENEL initiates the first rate increases.

ENEL's Nuclear Experience

To date, ENEL's limited experience with nuclear power development probably has been no worse than that of the other major developed countries. Technical and siting difficulties have been a major source of problems. One of ENEL's four existing nuclear power plants, the Latina facility, has been operating at less than 75 percent of

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its rated 210-MWe capacity since 1969 because of technical problems. Similar difficulties also kept a reactor at Trino out of service from 1967 to 1970 and delayed completion of an 840-MWe nuclear plant at Caorso.

ENEL's building program for both nuclear and thermal power plants has been hindered by siting difficulties throughout the 1970s. Thus ENEL only recently won approval from local authorities for a site selected in 1974 at Montalto di Castro for two nuclear plants. Local approval of a second site, at Termoli, chosen at the same time still has not been granted. ENEL has just about abandoned hope of winning approval for the site; a survey for a new location in northern Italy is now under way. Making the survey and getting Rome's approval of a new site should delay matters by at most an additional 13 months; after that negotiations for local approval will begin. In a repeat of ENEL's experience on the mainland, Rome's announcement of plans to build a nuclear power plant in Sicily is generating adverse reaction from the island's press and officials. It seems almost certain that construction will be delayed there also.

GDP and Electricity Growth

The massive nuclear construction program in the NEP rests on several questionable assumptions made by Rome about projected economic growth and demand for electricity over the next several years. Recent ENEL plans have assumed real economic growth will average 4 percent in 1976-80 and 4 to 5 percent in 1981-85. ENEL projected growth in electricity demand associated with these two growth rates at 6.4 percent and 6.4 to 8.0 percent, respectively. (From 1970 to 1974, prior to the worldwide recession, Italy's real economic growth averaged 4 percent annually. Electricity demand grew at 5.9 percent a year in the same period.)

We believe that Rome's projections are unrealistic, largely because of the poor outlook for the Italian economy in the near term. Real economic growth cannot be expected to average more than 3 percent annually through the mid-1980s. At this rate, net generating capacity of about 53,000 MW would be required to meet projected electricity demand in 1985. Should the economy grow more slowly, at 2 percent, for example, net generating capacity of 48,100 MW would suffice for 1985.

ENEL can raise capacity to 53,000 MW by additions to hydroelectric and conventional thermal capacity that are now under construction, without embarking on a massive new commitment to nuclear power. Under any one of a variety of assumptions about completing nonnuclear plants currently under construction and retiring obsolete facilities, generating capacity available in 1985 would range between 53,000 MW and 58,000 MW. Indeed, even in the unlikely event that Italy's economic performance is better than we now anticipate, with real growth averaging about 4

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Italy: Electricity Demand Projections, 1985

| 1976-85 GDP Growth Assumptions (Percent) | Electricity Consumption (GWh) | Peak Demand (MW) | Required Net Capacity ¹ (MW) |
|--|-------------------------------------|------------------------|---|
| 2.0 | 192,000 | 37,000 | 48,100 |
| 3.0 | 211,000 | 40,800 | 53,000 |
| 4.0 | 233,000 | 45,000 | 58,400 |
| 4.5 | 244,000 | 47,200 | 61,300 |

¹ Assuming 23 percent of capacity is held in reserve.

percent annually, ENEL's current construction program for nonnuclear facilities would still be able to meet projected demand. Moreover, our capacity projections are conservative since they exclude provision for any expansion of generating facilities owned by industrial firms and other public suppliers, which together account for 25 percent of total generating capacity.

Alternatives to Nuclear Power

From Rome's perspective, its underlying problem is to reduce the electric power system's dependence on oil. Although the government has opted to do this by going nuclear, opportunities exist to switch many oil-fired power plants to other fuels and to increase the use of coal and natural gas in bifueled plants.

Approximately one-half of the electric power system's 26,000 MW of conventional thermal capacity at the end of 1977 was equipped to operate solely on oil. Roughly 12,000 MW of the balance could have burned oil and one other fuel—natural gas, coal, manufactured gas, or lignite. Nevertheless, only about 20 percent of the output of thermal plants was produced with nonoil fuels in 1976.

Coal is probably the most economical substitute. To generate electricity economically from coal, a power plant must have the appropriate boilers, as well as facilities to store and handle coal and ash. At present, about 4,300 MW of capacity that could burn coal operates partly on oil because of inadequate coal-handling facilities. Access to a port or railroad is also necessary to keep coal transport and ash removal costs within acceptable limits. In addition, coal-fired plants need more maintenance than oil-fired facilities. For planning purposes ENEL has estimated that coal-fired plants operate for only 3,000 to 3,500 hours annually compared to 5,000 hours for large oil fueled plants.*

* Coal-fired plants in the United States generally run for 4,800 to 6,100 hours annually. We cannot explain why ENEL plans such a low rate of utilization, particularly since there seems to be no technical or economic reason for it. In fact, the National Hydrocarbons Agency (ENI) has assumed that coal-fired plants would operate 5,000 hours per year in its projections of national coal consumption in the 1980s.

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| Italy: Net Production of Electricity by Primary Energy Sources | | | | | | | | |
|--|----------------|--------------------------------|----------------|--------------------------------|----------------|--------------------------------|----------------|--------------------------------|
| | 1973 | | 1974 | | 1975 | | 1976 | |
| | GWh | Share of Total (Percent) | GWh | Share of Total (Percent) | GWh | Share of Total (Percent) | GWh | Share of Total (Percent) |
| Total | 139,103 | 100 | 142,266 | 100 | 140,935 | 100 | 150,214 | 100 |
| Hydro | 38,901 | 28.0 | 39,129 | 27.5 | 42,354 | 30.1 | 40,704 | 26.1 |
| Geothermal | 2,319 | 1.7 | 2,340 | 1.6 | 2,331 | 1.7 | 2,382 | 1.5 |
| Nuclear | 2,973 | 2.1 | 3,227 | 2.3 | 3,613 | 2.6 | 3,612 | 2.3 |
| Conventional thermal | 94,910 | 68.2 | 97,570 | 68.6 | 92,637 | 65.7 | 109,516 | 70.1 |
| Coal | 1,737 | 1.2 | 2,643 | 1.9 | 1,750 | 1.2 | 3,344 | 2.1 |
| Lignite | 1,114 | 0.8 | 1,004 | 0.7 | 1,237 | 0.9 | 1,179 | 0.8 |
| Oil | 84,189 | 60.5 | 86,210 | 60.6 | 78,725 | 55.9 | 87,823 | 56.2 |
| Natural gas | 4,221 | 3.0 | 3,780 | 2.7 | 7,235 | 5.1 | 13,224 | 8.5 |
| Manufactured gas | 2,526 | 1.8 | 2,451 | 1.7 | 2,543 | 1.8 | 3,051 | 2.0 |
| Other | 1,123 | 0.8 | 1,482 | 1.0 | 1,147 | 0.8 | 895 | 0.6 |

Taking these factors into account, we estimate that a total of about 8,400 MW of ENEL's existing oil-fired and oil/coal-fired capacity could be economically equipped to burn only coal. With such conversion by 1985, about 22 percent of anticipated thermal capacity could be coal fired, compared to 11 percent in 1976.

Conversion of a few plants now using oil exclusively is already under way or planned. A changeover at the 480-MW Sulcis plant will cost an estimated \$7 million. At the current price differential between oil and coal, ENEL expects lower fuel costs to repay the investment in only one year. Planned conversion of the 1,205-MW Brindisi power plant has an estimated payback period of four to six years. ENEL has also marked another 2,415 MW for possible conversion to coal during the 1980s. ENEL estimates the total capital cost of converting the 4,100 MW at about \$280 million (1977 prices), excluding finance charges.

| Italy: Oil-Fired Plants Expected to be Converted to Coal | | | |
|--|----------------------|---|--|
| | Net Capacity (MW) | Conversion Cost ¹ (US \$ per kW) | Status |
| Sulcis | 480 | 15 | Conversion under way. |
| Brindisi | 1,205 | 54 | Conversion planned but not started. |
| Milazzo | 1,205 | 71 | Conversion not yet decided. |
| Piombino | 1,210 | 105 | Conversion not yet decided; 2-3 sections still under construction. |

¹ Excluding finance charges.

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Italy: Net Capacity of Thermal Power Plants by Fuel, 1976

| | Net Capacity (MW) | Share of Total Capacity (Percent) |
|---|----------------------|---|
| Total conventional thermal | 24,851 | 60.7 |
| Single-fueled | 14,046 | 34.3 |
| Oil | 13,366 | 32.6 |
| Natural gas | 346 | 0.8 |
| Manufactured gas | 273 | 0.7 |
| Lignite | 61 | 0.1 |
| Dual-fueled | 10,805 | 26.4 |
| Oil/natural gas | 5,386 | 13.2 |
| Oil/coal | 2,813 | 6.9 |
| Oil/manufactured gas | 2,372 | 5.8 |
| Oil/lignite | 234 | 0.6 |
| Single- and Dual-fueled operated | | |
| Oil | 24,171 | 59.0 |
| Natural gas | 5,732 | 14.0 |
| Coal | 2,813 | 6.9 |
| Manufactured gas | 2,645 | 6.5 |
| Lignite | 295 | 0.7 |

Natural gas could also be increasingly substituted for oil. Rome has natural gas contracts with the USSR and the Netherlands and last year added another with Algeria to import gas via a planned pipeline across the Mediterranean Sea. But it remains to be seen if significantly more gas will be employed as a power plant boiler fuel. Some elements within the government argue that it is too valuable to put to such use. An internal planning document on the electric power system produced by ENI suggests that using gas for electricity generation should be given low priority. Nevertheless, Italy will have a substantial number of oil/natural gas-fired plants in the 1980s. In 1976, 23 percent of thermal capacity was equipped to operate on either oil or natural gas, but gas generated only 12 percent of the output of thermal plants, primarily because it was used intermittently in oil/gas-fuel boilers.

As for other nonnuclear energy sources, the substitution potential is very limited. Most of Italy's hydroelectric potential has already been developed. At the end of 1975, 5,800 MW of new hydroelectric capacity was under construction or planned for completion by 1985. One-half of this capacity is pumped storage which will be used only to meet peak demand. Economically recoverable geothermal resources are small and will never make more than a token contribution to electric power supply. New geothermal discoveries are not expected to do much more than replace the output of fields now being depleted.

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Outlook

For the moment at least, Rome is committed to its nuclear program despite the huge potential price tag. Even without a major policy change, however, the program may be pared further or stretched out as the government continues to weigh the uncertainties of oil supply availability in the 1980s, the costs of converting existing facilities to other fuels, and the need for generating capacity in the next decade. Siting and financial problems may also impose retarding effects. In any event, the long lead times involved in siting and constructing nuclear plants make it unlikely that Italy will have more than one additional nuclear plant by 1985, and even that will not be needed to meet projected demand.

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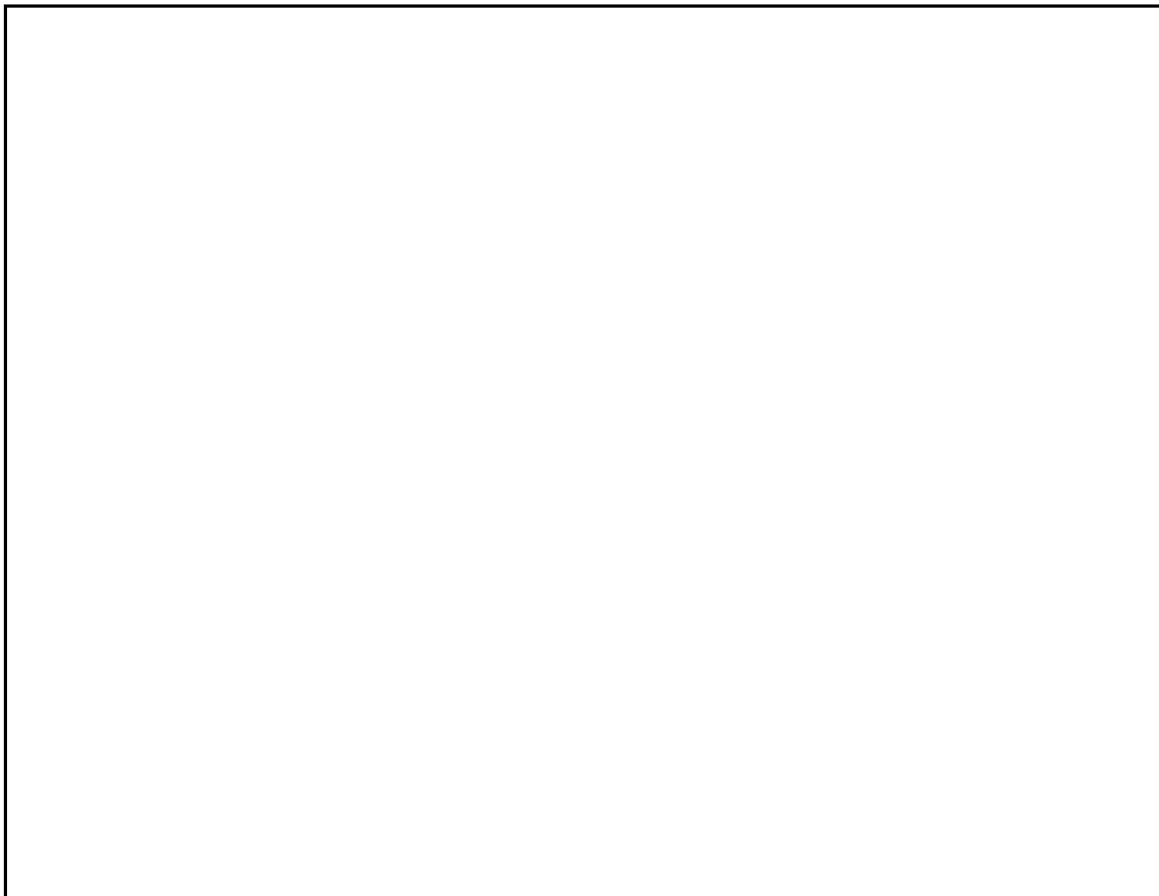
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NORWAY: SLOW OIL DEVELOPMENT PROMPTS POLICY CHANGES

The Norwegian Government is trying to quicken the pace of oil exploration and development in the North Sea. Production delays, soaring costs, and the country's swiftly rising foreign debt have persuaded the Labor government—with support from the opposition Conservatives—to speed up the exploration of areas below the 62nd parallel. Exploration north of the 62nd still will not begin until 1980. Even with stepped up exploration in the southern sector, output of oil and gas will not reach the ceiling of 1.8 million b/d set by the legislature until 1985, five years behind schedule.

Fourth Round Under Way

The government is moving faster than anticipated a year ago in processing applications to participate in the fourth round of licensing. Originally the Oil Ministry intended to allocate only a few of the 15 blocks being offered, reserving the others

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until the results of the drilling on the first allocation had come in. Now the plan is to allocate all 15 as fast as terms can be agreed. As of 1 June, 36 applications had been received from 47 companies, and negotiations are slated for mid-August. Oil Minister Gjerde estimates that about one-half of the blocks will be allocated by the end of this year with the remainder parceled out in 1979. At the earliest, drilling can begin in the spring of next year.

As with licenses issued in the third round, Statoil, the national oil company, will get at least a 50 percent interest in all concessions in the 15 blocks. In addition, Statoil's share of expenses will be covered by the other companies involved until a commercial discovery is made. The Oil Ministry is also considering lowering royalties and taxes to encourage early development of six marginal fields which border several of the 15 blocks. In these fields, reserves are too small or locations too distant from current fields to make them commercially attractive.

A new feature of the fourth round is the government's attempt to link oil development with other industrial projects. Companies planning to set up nonoil business operations in Norway apparently will be given preference when oil license applications are being considered. The recent deal with Volvo, the Swedish car maker, is part of this strategy. The Norwegian Government, through a new holding company, has taken over 40 percent of Volvo's present assets and liabilities except Volvo Petroleum; in return Volvo Petroleum will be awarded at least one block under the fourth licensing round. The joint Norwegian-Swedish company is to invest from \$90 million to \$130 million in Norway over the next five years, including the move to Norway of a major engine manufacturing subsidiary employing 3,000 to 5,000 workers.

Oslo also authorized the start of drilling this summer in the highly promising "gold block." This block is close to the Statfjord field—the largest in the Norwegian sector of the North Sea—and oil and gas finds could probably be developed in conjunction with that field. The "gold block" is reserved for an all Norwegian group headed by Statoil.

Oil Problems Mount

Norway's oil and gas development has been plagued by soaring costs and production delays. Total costs for bringing existing commercial discoveries into production are put at more than \$15 billion, far exceeding initial estimates. The cost of developing the entire Norwegian sector originally was projected at \$30 billion.

Development costs at Statfjord already have reached \$7.6 billion, and production is not expected to start until next summer, a year behind schedule. Much of the delay

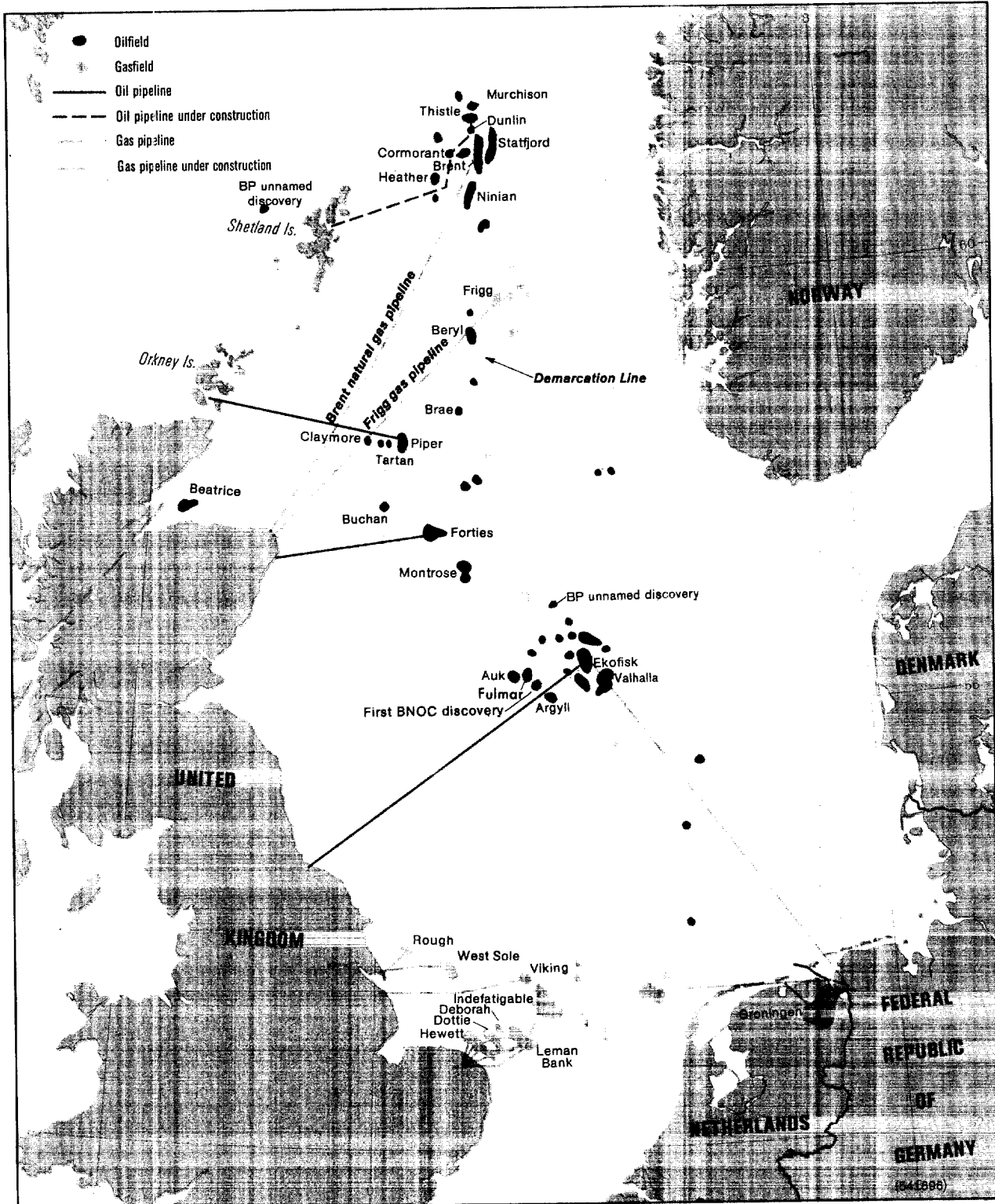
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has stemmed from squabbles over safety procedures between the oil companies and the government. The blowout at the Ekofisk field in April 1977 led Oslo to insist on government approval for installing almost every piece of equipment.

Problems at Ekofisk and Statfjord along with the disappointing results of third-round drilling have caused the Oil Ministry to reduce its estimates of future production. In consequence, projected state revenues for 1979-82 have been cut from \$13.3 billion to \$9.5 billion. A large portion of Norway's oil revenues will be used to service the country's huge foreign debt. Foreign indebtedness is expected to reach about \$20 billion, or 50 percent of GNP by the end of this year, much of it generated by offshore oil and gas projects.

Norway's state ventures in downstream petroleum activities have proven financially disastrous. The 80,000-b/d refinery at Monstad in West Norway and the petrochemical complex at Rafnes in East Norway, both built to process cheap feedstock from Ekofisk, have incurred heavy cost overruns. The Phillips Group, license holder at Ekofisk, agreed to provide natural gas liquids for at least 15 years free of transport costs and at below market prices in exchange for government permission to pipe Ekofisk oil to Teeside in Britain. Supplies of feedstock which were slated to reach the plants in early 1977 will not arrive until late this year. In the meantime, the firms have had to import natural gas liquids at market prices.

Reserves Barely Tapped

Only a small portion of the Norwegian sector of the North Sea has been explored. Proved and probable reserves are currently estimated at 8 billion barrels of crude oil and 25 trillion cubic feet of natural gas. Oil production last year was only 300,000 b/d and gas output amounted to 76 billion cubic feet—both produced primarily from the Ekofisk field. Under present plans, output at Ekofisk is expected to reach a peak output of 660,000 b/d of oil and 60 billion to 67 billion cubic feet per day of natural gas in 1980.

Gas production began last September in the joint British-Norwegian Frigg field. Frigg reserves are estimated at more than 7 trillion cubic feet of relatively "dry" low-sulfur gas of which 61 percent are in Norwegian territory. Norway has agreed to sell all of its Frigg gas output over the next 20 years to the British Gas Corporation because of difficulties in pipeline construction across the Norwegian trench, which is more than 300 meters deep in places.

Despite pressure from Statoil and private Norwegian oil companies, Oslo is delaying exploration north of the 62nd parallel. The legislature wants more reassurance of protection for Norwegian fisheries and of antipollution control before it gives the final go-ahead. Local interests are divided. Exploration was originally due to start this year, but policy disagreements, reinforced by the blowout at Ekofisk, led Oslo to postpone it until 1980.

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AUSTRIA: NUCLEAR REFERENDUM

Austria will hold a referendum in November on whether to start up its first nuclear power plant at Zwentendorf. The facility, a 692-megawatt, boiling water reactor built by the German firm Kraftwerk Union, has been ready for operation since last January. It is standing idle because of Vienna's inability to find an acceptable storage site for spent nuclear fuel.

In opting for the referendum, Chancellor Bruno Kreisky and his ruling Socialist Party appear to have defused what the opposition People's Party had hoped to use as the main issue in next year's national elections. Since the government's decision to hold the referendum, polls show 52 to 58 percent of the electorate favoring startup of the Zwentendorf plant. The Socialists, by controlling the wording of the referendum, will try for an even larger majority in the November vote, thus providing a favorable setting going in to the national elections. They will also stress the safety features of the plant, the country's need to reduce costly energy imports, and the financial drain of an idle \$450 million investment.

The Chancellor has come under increasing pressure to resolve the nuclear impasse. The government initially chose not to operate the reactor until arrangements had been completed for spent fuel storage. However, the original plan to store it in Austria provoked a storm of protest. The United States, which as supplier of the Zwentendorf fuel controls its disposition, has put off a decision on whether to accept spent fuel for storage or allow it to be stored or reprocessed elsewhere. A hurried search for a foreign storage site earlier this year yielded a provisional agreement with Egypt, which would also be subject to US approval. Vienna apparently intends to hold out for a favorable US decision to store Austrian spent fuel in the United States but is citing the Egyptian option to assuage public opinion. If the results of the referendum are positive, the Austrians apparently intend to begin operations on the assumption that storage arrangements will be worked out before the first spent fuel must be discharged, which would be about two years later.

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